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hinge arms. The hinge device further includes a first hinge module accommodated by the hinge hole of the first hinge arm so as to rotatably connect the double hinge arm to the first housing, and a second hinge module accommodated by the hinge hole of the second hinge arm so as to rotatably connect the double hinge arm to the second housing.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of an example of a portable wireless terminal employing a hinge device in accordance with an embodiment of the present invention;

FIG. 2 is an exploded perspective view of the portable wireless terminal of FIG. 1;

FIG. 3 is an exploded perspective view of a first hinge module of FIG. 2;

FIG. 4 is an exploded perspective view of a second hinge module of FIG. 2; and

FIGS. 5 through 9 are perspective views showing examples of an opening and closing action of the portable wireless terminal of FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Several preferred embodiments of the present invention will now be described in detail with reference to the annexed drawings. In the drawings, the same or similar elements are denoted by the same reference numerals even though they are depicted in different drawings. In the following description, a detailed description of known functions and configurations incorporated herein have been omitted for conciseness.

FIG. 1 is a perspective view of an example of a portable wireless terminal 100 employing a hinge device 200 in accordance with an embodiment of the present invention, and FIG. 2 is an exploded perspective view of the portable wireless terminal 100 of FIG. 1. As shown in FIGS. 1 and 2, the portable wireless terminal 100 in accordance with an embodiment of the present invention comprises a first housing 101, a second housing 102, and the hinge device 200 for rotatably connecting the first housing 101 to the second housing 102.

As shown in FIG. 1, when the second housing 102 is substantially overlapped on the first housing 101 so as to expose its front surface to the outside, the portable wireless terminal 100 is operating in a communications mode.

A keypad 121, a first display device 123, a transmitting unit 125 (including a microphone installed therein), and a receiving unit 127 (including a speaker installed therein) are provided on the front surface of the second housing 102. The keypad 121 is used to recall various menus and information in order to communicate with a user, and transmit and receive data. The first display device 123 is used to display various information required in the communication mode such as transmitting and receiving states and a terminal state.

Referring to FIG. 2, a second display device 21 (used in a PDA mode) and function keys 23 for the PDA mode are provided on the rear surface of the second housing 102. When the second housing 102 is opened from the first housing 101, the portable wireless terminal 100 is used as an information terminal with the functions of a PDA instead of

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the functions of a portable terminal. The second display device 21 can be a touch screen.

A keyboard 11 used to input data in the PDA mode is provided on the front surface of the first housing 101, which is opposite to the rear surface of the second housing 102. It can be appreciated to those skilled in the art that the keyboard 11 of FIG. 2 can be of several different types, including, but not limited to, a press-type keyboard. The press-type keyboard is mechanically operated, and generally used in personal computers. Another type of keyboard that can be used is a touch screen-type keyboard. When a touch screen is installed on the first housing 101 as the data input means, the touch screen can also be used as the display device, thereby extending the functions of the terminal 100.

The hinge device 200 is installed on the side surface of the terminal 100. However, the hinge device 200 can also be installed on the top or bottom surface of the terminal 100.

The hinge device 200 includes a double hinge arm 210, a pair of hinge modules 300 and 400, and a pair of hinge dummies 299.

The double hinge arm 210 includes a first hinge arm 211 rotatably connected to the first hinge housing 101, and a second hinge arm 213 formed integrally with the first hinge arm 211, and rotatably connected to the second hinge housing 102. The first hinge arm 211 and second hinge arm 213 being parallelly or substantially parallelly connected to each other. The double hinge arm 210 can therefore be rotated about the first and second housings 101 and 102. Openings 295 and 297 for accommodating the double hinge arm 210 are respectively formed on the first side surfaces of the first and second housings 101 and 102. Each of the openings 295 and 297 is shaped to enable engagement with the first hinge arm 211 or the second hinge arm 213. Therefore, when the first and second hinge arms 211 and 213 are respectively connected to the openings 295 and 297, the outer circumference of the double hinge arm 210 is engaged with the outer surface of the first or second housing 101 or 102. The double hinge arm 210 is rotated at or about 180° about the first and second housings 101 and 102. A pair of hinge holes 211a and 213a are formed on a first end of the double hinge arm 210. The hinge holes 211a and 213a are respectively formed on the first and second hinge arms 211 and 213 of the double hinge arm 210.

Rotary axes A1 and A2 shown in FIG. 5 of the double hinge arm 210 are respectively connected to the first and second housings 101 and 102 by a pair of the hinge modules 300 and 400, and a pair of the hinge dummies 299. The pair of the hinge modules 300 and 400 consist of the first hinge module 300, shown in FIG. 3, and the second hinge module 400, shown in FIG. 4. The hinge modules 300 and 400 are parallelly or substantially parallelly installed in the first and second housings 101 and 102 respectively. As shown in FIGS. 3 and 4, the hinge modules 300 and 400 respectively include a hinge housing 310, hinge shafts 320 and 420, hinge cams 330 and 430, and a hinge spring 340. The first hinge module 300 differs from the second hinge module 400 in the shapes of the hinge shafts 320 and 420 and the hinge cams 330 and 430.

The first and second hinge modules 300 and 400 will now be discussed in detail with reference to FIGS. 3 and 4. One end of the hinge housing 310 is a closed end 312, and the other end of the hinge housing 310 is an opened end 311a with a through hole 311b formed thereon. A receiving cavity 313 is provided on the hinge housing 310 which is opened at a first side surface of the hinge housing 310. A guide groove 315 with a designated length is formed on the inner wall of the hinge housing 310. A projection 317 projects